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DOE/RL-97-05

UC-630

Radioactive Air Emissions Notice of Construction Use of a Portable Exhauster at 244-AR Vault

Date Published

January 1997

United States
Department of Energy

P.O. Box 550
Richland, Washington 99352

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Richland Operations Office
P.O. Box 550
Richland, Washington 99352

97-EAP-224

FEB 03 1997

Mr. Jerry Leitch, Chief
Radiation and Indoor Air Section
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Dear Mr. Leitch:

RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION (NOC) FOR USE OF A PORTABLE EXHAUSTER AT THE 244-AR VAULT

Enclosed is the NOC requesting approval to construct a portable exhauster on the 244-AR Vault for use during pumping of secondary containment, tank stabilization, and other activities (i.e., transfer or pumping of radioactive liquid using existing equipment, entries for maintenance and inspections) pursuant to Washington Administrative Code 246-247-060 and 40 Code of Federal Regulations 61.96.

Active ventilation is required to provide contamination control during numerous activities such as pumping radioactive waste from secondary containment, tank pumping or mixing, sump pumping, or decontamination activities. The pumping of approximately 6,813 liters (1,800 gallons) of waste from secondary containment into a tank within the 244-AR Vault is the first planned activity since 1993 requiring active ventilation.

The estimated potential unabated offsite dose from active ventilation of 244-AR Vault is 5.3 millirem per year.

Should you have any questions or comments, please contact Stephen Bradley, on (509) 376-7333.

Sincerely,

James E Rasmussen

James E. Rasmussen, Director
Environmental Assurance, Permits,
and Policy Division

MSD:SDB

Enclosure

cc w/encl:
J. Wilkinson, CTUIR
D. Powaukee, Nez Perce Tribe
R. Jim, YIN
J. Bates, FDH
D. Alison, LMHC
C. Allen, LMHC
N. Homan, RFSH
J. Luke, RFSH

CONTENTS

APPENDICES

FIGURES

TABLES

TERMS

BARCT	best available radionuclide control technology
CFR	*Code of Federal Regulations*
DCRT	double-contained receiver tank
DOH	Washington State Department of Health
EPA	U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air
MEI	maximally exposed individual
NOC	notice of construction
SEPA	*State Environmental Policy Act of 1971*

METRIC CONVERSION CHART

The following conversion chart is provided to the reader as a tool to aid in conversion.

Into metric units | Out of metric units

If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.0393	inches
inches	2.54	centimeters	centimeters	0.393	inches
feet	0.3048	meters	meters	3.2808	feet
yards	0.914	meters	meters	1.09	yards
miles	1.609	kilometers	kilometers	0.62	miles
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092	square meters	square meters	10.7639	square feet
square yards	0.836	square meters	square meters	1.20	square yards
square miles	2.59	square kilometers	square kilometers	0.39	square miles
square miles	259	hectares	hectares	0.00391	square miles
acres	0.404	hectares	hectares	2.471	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.0352	ounces
pounds	0.453	kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
Volume			**Volume**		
fluid ounces	29.57	milliliters	milliliters	0.03	fluid ounces
quarts	0.95	liters	liters	1.057	quarts
gallons	3.79	liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic feet per minute	0.02832	cubic meters per minute			
cubic yards	0.76	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
BTU/hour	2.93 E-4	kilowatts			
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit

RADIOACTIVE AIR EMISSIONS
NOTICE OF CONSTRUCTION
USE OF A PORTABLE EXHAUSTER AT 244-AR VAULT

1.0 INTRODUCTION

This document serves as a notice of construction (NOC), pursuant to the requirements of Washington Administrative Code (WAC) 246-247-060, and as a request for approval to construct pursuant to 40 Code of Federal Regulations (CFR) 61.96, for the use of a portable exhauster at the 244-AR Vault during transfers or movement of radioactive waste as part of pumping of secondary containment, tank stabilization/pumping, and other activities (i.e., transfer or pumping of radioactive waste using established procedures, entries for maintenance and inspections) within the 244-AR Vault.

The 244-AR Vault is considered to be a double-contained receiver tank (DCRT) based on its functional characteristics, although it is not listed as one of the five designated DCRTs in the 200 Area tank systems. The 244-AR Vault is equipped with two stacks that have not operated since 1993. It has been determined that it would not be cost effective to repair the exhaust trains to an operational condition, thus the need for a portable exhauster to support intermittent operations.

Active ventilation is required to provide contamination control during numerous activities such as pumping radioactive waste from secondary containment, tank pumping or mixing, sump pumping, or decontamination activities. The pumping of approximately 6,813 liters (1,800 gallons) of waste from secondary containment into a tank within the 244-AR Vault is the first planned activity since 1993 requiring active ventilation.

2.0 FACILITY LOCATION (Requirement 1)

The 244-AR Vault is located west of the 241-A Tank Farm in the 200 East Area of the Hanford Site. Figure 1 shows the location of the 200 East Area within the Hanford Site. Figure 2 shows the location of the 244-AR Vault within the 200 East Area. The geodetic coordinates of the 244-AR Vault are as follows:

Latitude: 46 degrees, 33 minutes, 12.29 seconds North
Longitude: 119 degrees, 31 minutes, 06.38 seconds West

U.S. Department of Energy, Richland Operations Office
Hanford Site
200 East Area, 244-AR Vault
Richland, Washington 99352

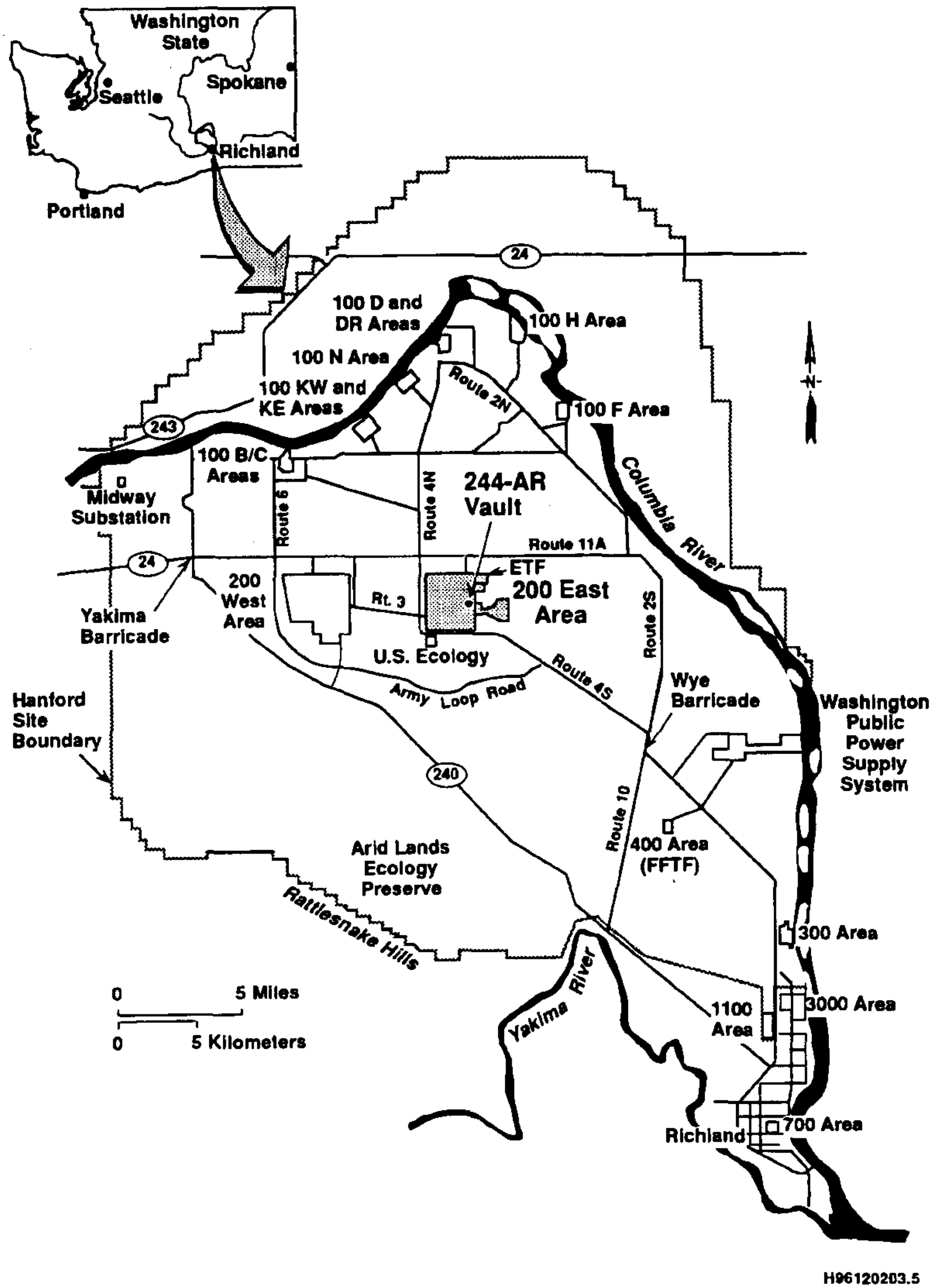

Figure 1. Hanford Site.

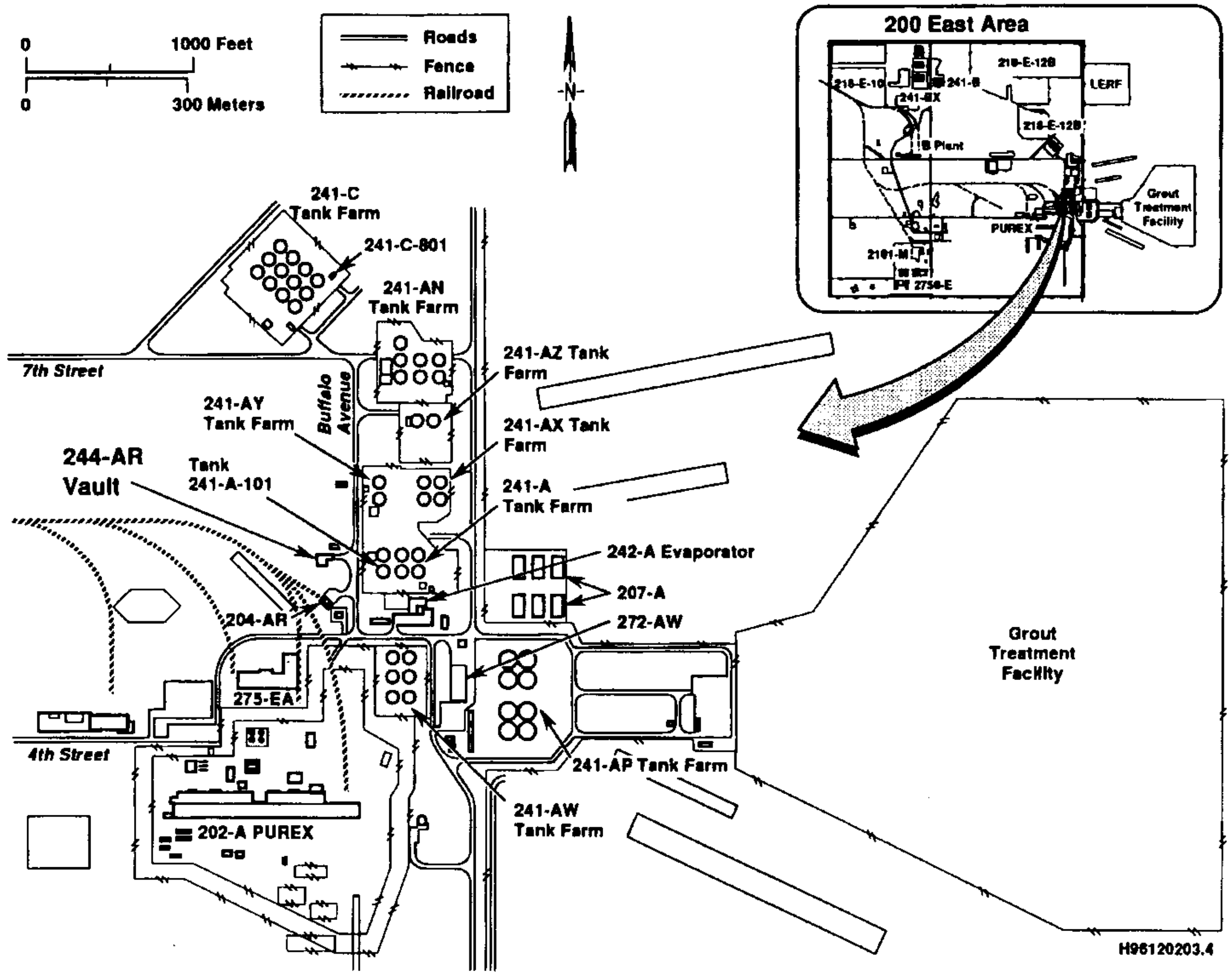

Figure 2. Location of the 244-AR Vault within the 200 East Area.

3.0 RESPONSIBLE MANAGER (Requirement 2)

The responsible manager's name and address are as follows:

Mr. M. J. Royack, Program Manager
Tank Waste Remediation System, Waste Storage Division
U.S. Department of Energy, Richland Operations Office
P.O. Box 550
Richland, Washington 99352
(509) 376-4420.

4.0 TYPE OF PROPOSED ACTION (Requirement 3)

The proposed action is a modification to an existing emission unit. The proposed modification is to install and operate a portable exhauster at the 244-AR Vault during intermittent operations, which may require active ventilation (i.e., pumping waste from secondary containment, tank stabilization/pumping, and other activities).

5.0 STATE ENVIRONMENTAL POLICY ACT (Requirement 4)

This activity is categorically exempt from the State Environmental Policy Act process.

6.0 PROCESS DESCRIPTION (Requirements 5 and 7)

The original purpose of the 244-AR Vault, beginning in 1966, was to transfer waste from the PUREX Facility, A-Tank Farm, and AX-Tank Farm to B Plant. The goal of the strontium sludge processing operations in the 244-AR Vault was to remove the bulk of the strontium from the A- and AX-Tank Farms. This activity was completed in April of 1978. On the completion of this activity, the 244-AR Vault was cleaned out with the exception of 2,271 liters (600 gallons) of sludge left in tank 004 (from 241-AX-104 tank). Most of the sludge was transferred to and still remains in tank 002, as reported in the interim safety basis update for the 244-AR Vault (Appendix A). The 244-AR Vault has remained relatively inactive except for maintenance of vault sump levels and other activities such as entries for maintenance and inspections.

The 244-AR Vault has three exhaust trains and two stacks: the vessel vent stack (296-A-12) and the canyon stack (296-A-13). A single exhaust train supports the vessel vent stack and two parallel exhaust trains supply the canyon exhaust stack. The vessel vent, similar to other DCRTs, was designed to run intermittently during process operations. This stack has not operated since February 1993. The exhaust train on the vessel vent was intended to ventilate four tanks within the 244-AR Vault. The exhaust train was last operated periodically during the pumping of accumulated rainwater from the contaminated sumps into the tanks. The tanks were ventilated via a common pipe that passes through ports in the cell walls. These tanks are held in cells and are isolated from the 244-AR Vault canyon by non-airtight cover blocks (Figure 3). The canyon stack was designed to continuously ventilate the canyon and the three cells containing the tanks. This stack has been inactive since July 1993 pending maintenance.

The first planned activity in the 244-AR Vault requiring active ventilation is pumping an estimated 6,813 liters (1,800 gallons) of rainwater and contaminated waste accumulation from the cell 3 sump into tank 003. To maintain a negative pressure on the tanks while pumping, a 5.66 cubic meter per minute (200 cubic feet per minute) portable exhauster will be used. The portable exhauster will be hooked up to a riser outside the 244-AR Vault. The riser is connected to the vessel ventilation system and will ventilate the four tanks that are connected by a common 8-inch header (Figure 4). The valves/dampers connecting the vessel ventilation system to the existing exterior filter banks will be closed during the use of the portable exhauster to isolate the existing filter banks from the rest of the system. Make-up air will come from infiltration from the canyon.

Pumping of waste from secondary containment could employ existing steam operated systems modified to use compressed air. In addition, should this method not prove effective, other portable type pumping systems could be deployed within the 244-AR Vault to move the waste into primary containment.

After the initial pumping activity, additional sump pumping might be required at future dates to maintain compliance with dangerous waste regulations. The pumping of waste out of the tanks contained within the 244-AR Vault in support of stabilization efforts will be another activity requiring active ventilation. The exhauster might be operated continuously or intermittently as dictated by the periods of time during which waste is being pumped. Also, the need for periodic operation of the exhauster could arise for other activities performed within the 244-AR Vault. Such activities could include transferring or pumping of radioactive waste using existing equipment or methods generally employed in the Tank Farms, maintenance or repairs, inspections, removal of cover blocks, waste and air sampling, sparging or mixing of tank contents for transfer or treatment, and decontamination.

7.0 ANNUAL POSSESSION QUANTITY AND PHYSICAL FORM

(Requirements 8, 10, 11, and 12)

The 244-AR Vault contains approximately 120,000 curies, as shown in Table 1, which are predominately isotopes of strontium and cesium. Although there are other minor contributions, the vast majority of the source is attributed to 2,270 liters (600 gallons) of waste originating from the 241-AX-104 tank, which has been left in tanks 002 and 004 since 1978 (as described in Appendix A).

244-AR Vault

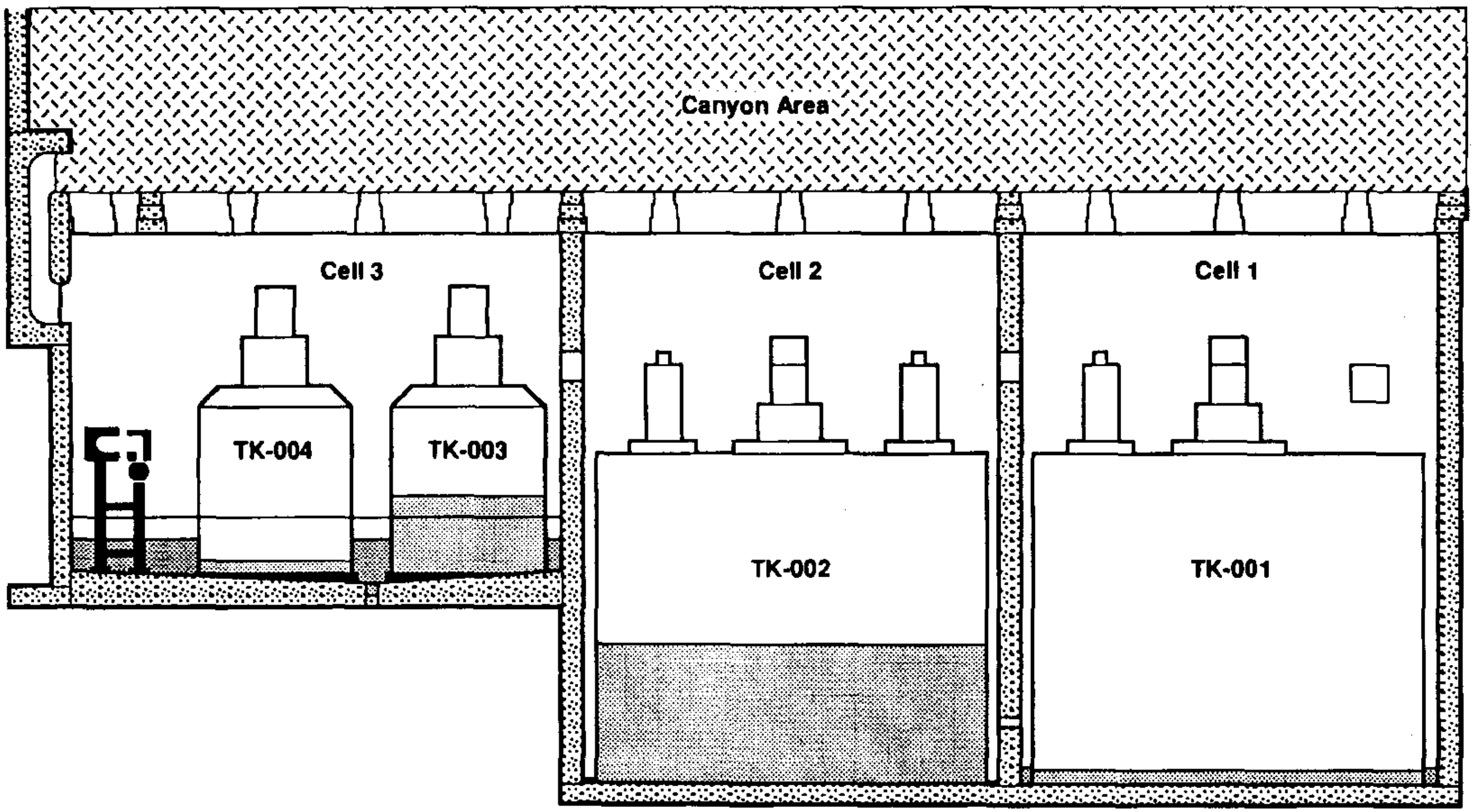

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Figure 3. 244-AR Vault.

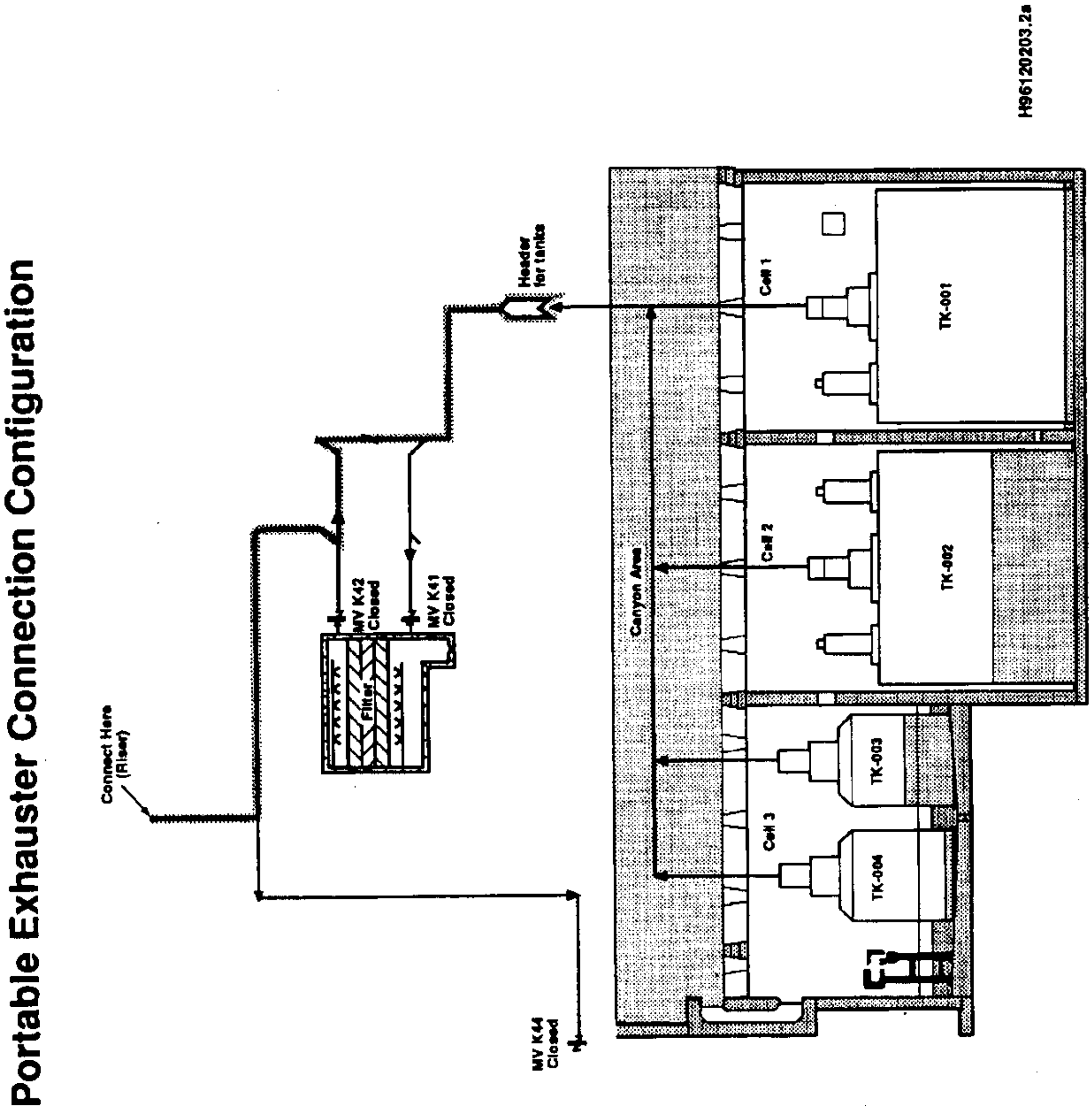

Figure 4. Portable Exhauster Connection Configuration.

Several assumptions bound and quantify the source and serve to acknowledge and document potential sources of uncertainty in the gross inventory.

- Tank liquid levels have increased from 2,270 liters (600 gallons) to 104,277 liters (27,550 gallons) since 1978 due to rainwater, steam condensate, and raw water leaks. This has not increased the inventory of radionuclides.

- The 244-AR Vault could have received very minor waste leakage during past waste transfers through piping that used the 244-AR Vault as a central low-point collection for secondary containment. These small leaks would not have significantly increased the inventory and are adequately addressed by the conservative estimate of waste inventory.

- The radionuclide inventory has aged (decayed) for 18 years, which has reduced the total beta/gamma inventory significantly.

- Not factored in was decay of plutonium isotopes.

- The radionuclide inventory associated with waste in secondary containment and surface contamination in the 244-AR Vault is negligible when compared to the contents of the tanks. This small contribution is developed for reference in Appendix B (WHC 1996b) but was not a factor in the dose calculations. The addendum to Appendix B outlines the methodology used.

- Only the radionuclides contributing greater than 10% of the potential effective dose equivalent to the maximally exposed individual per WAC 246-247-110(8) are identified in the 244-AR Vault waste inventory. Ten percent of the potential effective dose equivalent is 0.53 millirem per year (refer to Table 4). To be thorough and comprehensive, radionuclides contributing as little as 1.0 E-03 millirem per year were included (0.02%).

The total inventory is conservatively expressed as the sum of plutonium, strontium, and cesium. The inventory was developed using the most conservative values noted from either the TLM solids composite inventory estimate for the 241-AX-104 tank (WHC 1996a) (Appendix D) or from sludge sample data taken from tank 004 in the 244-AR Vault (RHO 1978) (Appendix E). The inventory is based wholly on the 2,270 liters (600 gallons) of waste left in tanks 002 and 004 from 1978 (Appendix A).

Table 1. Radionuclide Inventory of the 244-AR Vault.

Radionuclide	244-AR waste (curies/liter)	244-AR waste volume (liters)	Total inventory (curies)
Pu-239	2.05 E-03	2,270	4.65
Pu-240	3.20 E-04	2,270	0.73
Pu-241	3.34 E-03	2,270	7.58
Cs-137	0.85*	2,270	1.93 E+03
Sr-89/90	51.8*	2,270	1.18 E+05
Total			1.20 E+05

* Values reflect decayed source term (18 years) from data in Appendix E (RHO 1978).

8.0 CONTROL SYSTEM (Requirement 6)

The 244-AR Vault has its own exhaust systems, but because of the exceedingly high cost involved to bring the systems back into operation, a portable exhauster is being proposed. The portable exhauster system (i.e., control equipment, fan, and stack) design is shown in Figure 5. The system consists of a prefilter followed by two high-efficiency particulate air (HEPA) filters in a filter housing. The filters are designed to remove particulate radionuclides. The fan and stack complete the exhauster system.

Particulate radioactive emissions comprise the source of concern for the stated activities. The prefilter and HEPA filters are designed to remove particles from the air stream. The prefilter and HEPA filters will be testable to ensure that 99.95 percent of the particles with a median diameter of 0.3 micron will be removed from the air stream.

The exhaust rate will be approximately 5.66 cubic meters/minute (200 cubic feet per minute) when using a core sampling portable exhauster. A like-kind Washington State Department of Health (DOH)-approved portable exhauster with equivalent control equipment exhaust rates could also be used as a replacement during future operations. The replacement exhauster might exhaust up to 14.25 cubic meters per minute (500 cubic feet per minute).

9.0 MONITORING SYSTEM (Requirement 9)

The potential unabated total effective dose for this application of a portable exhauster is greater than 0.1 millirem per year. Therefore, the exhauster stack will be equipped with sampling equipment designed and operated in accordance with 40 CFR 61, Subpart H, and all referenced requirements. Among other design criteria, sample probes will be designed to obtain representative samples. The location of the sample probes will be selected in accordance with referenced standards, and sample line length and bends will be

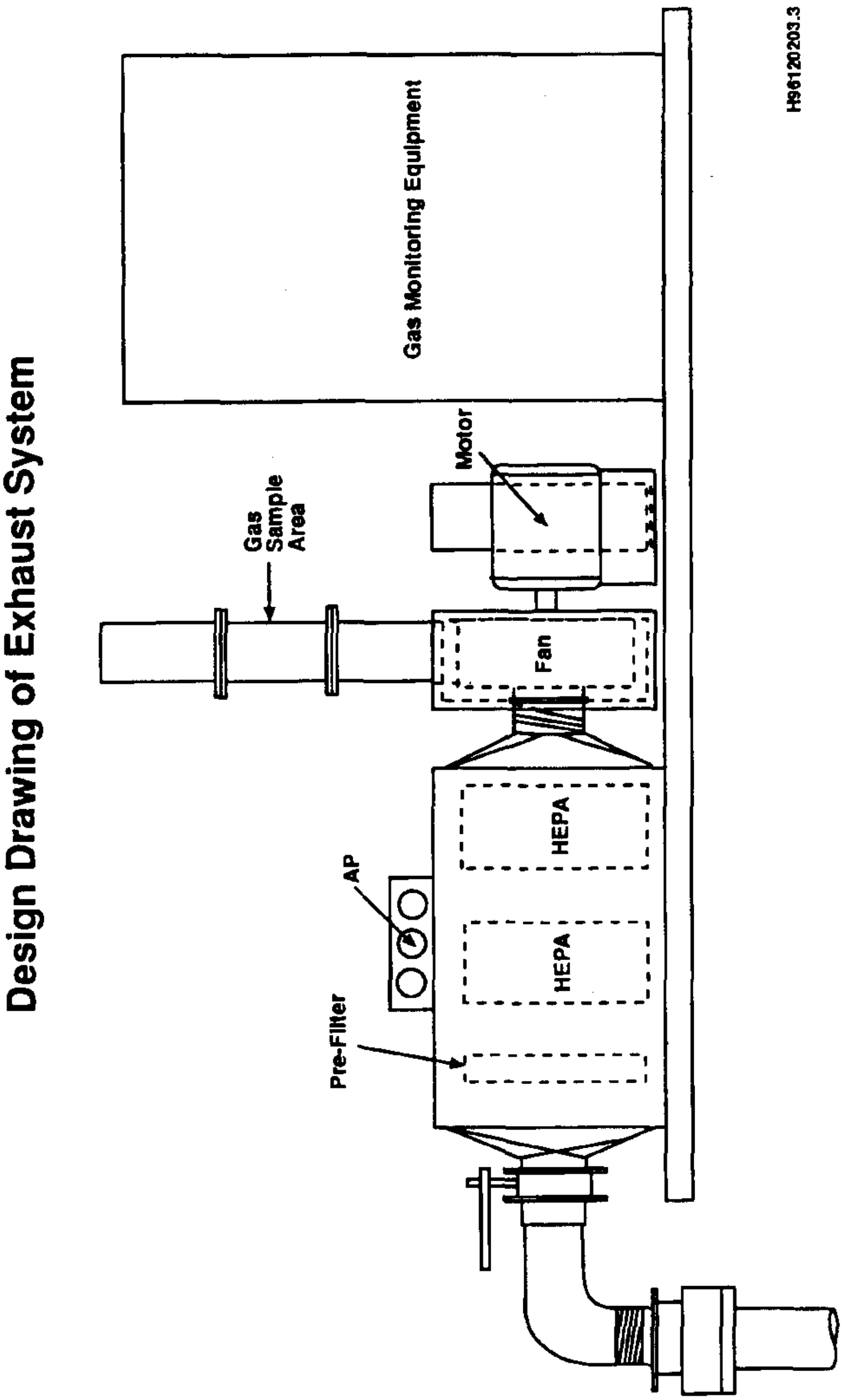

Figure 5. Exhaust System Design Drawing.

minimized. A beta/gamma continuous air monitor also will be installed as part of the monitoring system to meet the criteria of the U.S. Department of Energy (DOE/EH-0173-T). The detection limits will be in accordance with 40 CFR 61, Subpart H, and will meet all referenced requirements.

10.0 RELEASE RATES (Requirement 13)

Emissions resulting from the use of a portable exhauster on the 244-AR Vault are estimated in the following sections.

10.1 UNABATED EMISSIONS

Using the release fractions for particulates given in 40 CFR 61, Appendix D, the annual unabated emissions were calculated as follows:

Table 2. Unabated Emissions.

Radionuclide	Total inventory (curies)	Release fraction	Annual unabated emissions (curies per year)
Pu-239	4.7	1.0 E-03	4.7 E-03
Pu-240	0.7	1.0 E-03	0.7 E-03
Pu-241	7.6	1.0 E-03	7.6 E-03
Cs-137	1.9 E+03	1.0 E-03	1.9 E+00
Sr-89/90	1.2 E+05	1.0 E-03	1.2 E+02

10.2 ABATED EMISSIONS

Abated emission calculations are shown in Table 3. Because the filter banks are tested as a single unit, an efficiency of 99.95% was used for the entire filter bank. Abated emissions are determined by dividing unabated emissions by the appropriate decontamination factor.

Table 3. Abated Emissions.

Radionuclide	Annual unabated emissions (curies per year)	Decontamination factor	Annual abated emissions (curies per year)
Pu-239	4.7 E-03	2.0 E+03	2.4 E-06
Pu-240	0.7 E-03	2.0 E+03	3.5 E-07
Pu-241	7.6 E-03	2.0 E+03	3.8 E-06
Cs-137	1.9 E+00	2.0 E+03	9.5 E-04
Sr-89/90	1.2 E+02	2.0 E+03	5.9 E-02

11.0 OFFSITE IMPACT (Requirements 14 and 15)

This section contains information regarding the effective dose equivalents to the maximally exposed individual (MEI) offsite resulting from unabated and abated emissions from intermittent operations (i.e., pumping of secondary containment, tank stabilization/pumping, and other operations as previously described) of a portable exhauster on the 244-AR Vault. The MEI is located 16 kilometers (10 miles) east of the 200 East Area. The potential unabated dose is summarized in Tables 2 and 4 and the potential abated dose is summarized in Tables 3 and 4. These unit dose factors were submitted previously to the Washington State Department of Health. The information required to develop the unit dose factors from the Clean Air Assessment Package 1988 computer code also is included in *Unit Dose Calculation Methods Summary of Facility Effluent Monitoring Plan Determinations* (WHC 1991).

The dose resulting from all Hanford Site operations in 1995 was determined to be 2.9 E-03 millirems per year, excluding radon, for the MEI (DOE/RL-96-37). The highly conservative estimate of abated dose for the MEI from the activities described in this application is 2.6 E-03 millirems per year, excluding radon. The emissions originating from the portable exhauster, in conjunction with other current operations on the Hanford Site, will not result in a violation of the National Emission Standard of 10 millirems per year.

Table 4. Abated/Unabated Dose Consequence.

Radionuclide	Unabated emissions		Abated emissions	
	curies	millirem	curies	millirem
Sr-89/90	1.2 E+02	5.2 E+00	5.9 E-02	2.6 E-03
Cs-137	1.9 E+00	4.5 E-02	9.5 E-04	2.3 E-05
Pu-239	4.7 E-03	4.1 E-02	2.4 E-06	2.1 E-05
Pu-240	0.7 E-03	6.1 E-03	3.5 E-07	3.0 E-06
Pu-241	7.6 E-03	1.0 E-03	3.8 E-06	5.2 E-07
		5.3 E+00		2.6 E-03

The CAP-88 millirem per curie conversion factors are:

Sr-90 - 4.38 E-02
Cs-137 - 2.39 E-02
Pu-239 - 8.67 E+00
Pu-240 - 8.66 E+00
Pu-241 - 1.38 E-01.

12.0 COST FACTORS AND FACILITY LIFETIME (Requirements 16 and 17)

The HEPA filtration system, as described in Section 8.0, is best available radionuclide control technology (BARCT) for this application as approved in previous BARCT analyses. As such, cost factors for construction, operation, and maintenance of the control technology components and system have not been provided.

The need for further permitting for decommissioning will need to be addressed at a later date. Until such time there will be a potential for a release of the emission rates provided in this application. The portable exhauster could be operated continuously or intermittently, as required to support the described operations in the 244-AR Vault. Operations in the 244-AR Vault could continue for approximately 15 years.

13.0 TECHNOLOGY STANDARDS (Requirement 18)

As required by WAC 246-247-120, a technology standards demonstration to the DOH was performed for the portable exhauster to ensure compliance with the applicable substantive standards (DOE/RL-94-118). Approval of that demonstration supports the technology standard requirements of WAC 246-247-110(18).

14.0 REFERENCES

DOE/EH-0173T, *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*, January 1991, U.S. Department of Energy, Assistant Secretary for Environmental Safety and Health.

DOE/RL-94-118, *Radioactive Air Emissions Program Notice of Construction for the Rotary Mode Core-Sampling Systems Three and Four*, May 1995, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-96-37, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 1995*, June 1996, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

WHC, 1991, *Unit Dose Calculation Methods Summary of Facility Effluent Monitoring Plan Determinations*, WHC-EP-0498, Westinghouse Hanford Company, Richland, Washington.

WHC, 1996a, *Historical Tank Content Estimate for the Northeast Quadrant of the Hanford 200 East Area*, WHC-SD-WM-ER-349, Rev. 1a, dated September 26, 1996.

WHC, 1996b, *Tank Farm Stack NESHAP Designation Determination*, WHC-SD-WM-EMP-031, Rev. 2, dated January 19, 1996.

Internal Memo, R. E. Elder to J. D. Butler, et al., "CCIP Database Update for Second Quarter 1995", 33680-95-047, dated June 5, 1995, Westinghouse Hanford Company, Richland, Washington.

Internal Memo, J. S. Buckingham to G. D. Campbell, "Heat Generation of Residual Sludge in Tank 104 AX", 60120-78-040 J, dated June 15, 1978, Rockwell Hanford Company, Richland, Washington.

APPENDIX A

UNREVIEWED SAFETY QUESTION SAFETY REVIEW FORM

This appendix contains only page 1 of 3 of the review form. Page 1 of 3 contains the pertinent information regarding the waste inventory in the 244-AR Vault. It is believed this form was completed in 1994.

UNREVIEWED SAFETY QUESTION SAFETY REVIEW FORM

(Per WHC-IP-0842, 15.9)

REFERENCE DOCUMENT(S):

ECN No. 618316 PCA No. N/A

Work Pkg No. N/A Other (Specify) WHC-SD-WM-ISB-001, REV 0F

TITLE: INTERIM SAFETY BASIS UPDATE FOR 244-AR FACILITY

BACKGROUND INFORMATION

The 244-AR facility was designed to process and handle either CAW waste from PUREX or NCAW waste from Tank Farms storage tanks (A/AX Farms). The waste was then transferred to B-Plant for cesium and strontium recovery. The 244-AR facility operated from 1968 to 1978. Upgrades were planned in 1984 and several projects were started to ready the facility to process NCRW waste. The projects were intended to enhance 244-AR's ventilation and instrumentation systems. In 1988, funding for the upgrades was cut and work on all projects ceased, even though most of the project upgrades were 80-90% complete. A small amount of NCAW waste (< 600 gallons) from AX farms has been stored in 244-AR for approximately 17 years. The NCAW waste, which accounts for the majority of the source term, was being saved for PNL Laboratory Vitrification studies for the Savannah River Plant. The waste was never shipped to PNL and therefore, remains stored in TK-002.

Operations conducts daily surveillances of the sumps and tanks liquid levels in 244-AR. HPT's routinely monitor the facility for potential contamination spreads, since a source term remains within the facility. Since the late 1980's, the K3 canyon exhauster and the K4 vessel ventilation system are the only ventilation systems that have been operated. The other two ventilation systems (K1 and K2) have remained shutdown. The four banks of HEPA filters associated with the canyon exhaust system have not been aerosol tested since June of 1992.

244-AR Vault has been sitting in disrepair for 8-10 years. Only the K3-9-2 exhauster was left running (until July 1993 when shutdown), with no supply ventilation system running (K2 system) as described by the SAR. The K4 system has been operated intermittently, but only during transfers. In addition, the high radiation and high differential pressure (DP) interlocks to shutdown the canyon exhauster have been disabled. All other ventilation systems were either not operated because of equipment problems or simply just left shut down to make it easier to manage 244-AR over the past 10 years. It should be emphasized that the existing HEPA filters needed to be replaced since at least 1 bank of the original HEPA filters was identified as failing prior to 1984. A temporary fix, installing the 3rd HEPA bank and very small 4th bank (six pack) were designed to service the facility until a new system (under project B-462a and B-551) could be installed.

In July 1993, the canyon exhauster was shutdown due to a vibrating motor bearing. The vibrating motor bearings posed a potential hazard to personnel because of noise and the possibility of flying parts. The motor bearings have been replaced but the fan remains shutdown due to problems found with SD-WM-SAR-018, part of the AUTHORIZATION BASIS documentation.

Currently, there is approximately 12,000 gallons of liquid waste contained within 244-AR. Most of the solution is contained in Tk-001, Tk-002, Tk-003 and Tk-004. However, there is approximately 900 gallons of solution in canyon cell #3 sump. Since the sump is secondary containment for the canyon vessels, the liquid should be jetted to one of the tanks as soon as possible. In order for jetting to occur, canyon as well as vessel ventilation system must be restarted.

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APPENDIX B

TANK FARM STACK NESHAP DESIGNATION DETERMINATIONS

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6.0 STACK 296-A-13

6.1 SYSTEM DESCRIPTION/CONFIGURATION

The 296-A-13 stack system ventilates the 244-AR Vault canyon and containment cells associated with the four 244-AR vessels. The 244-AR Vault is located near the 241-A Tank Farm in the 200 East area.

The 244-AR Vault is considered to be a double-contained receiver tank (DCRT) in the Hanford Site Tank Farm Facilities Interim Safety Basis (WHC-SD-WM-ISB-001) based on its functional characteristics, although it is not listed as one of the five DESIGNATED DCRTs in the 200 Area tank system. The 244-AR Vault was first used to transfer waste in 1966. As with the 296-A-12 stack (also part of this facility) this stack is currently not operating. Future uses of this Vault is undetermined at this time.

Contained spaces which are ventilated by the 296-A-13 consist of the 244-AR canyon with dimensions of 94 feet x 18 feet x 36 feet high, two cells with dimensions of 21 feet x 21 feet x 32.8 feet deep each containing one of the two large process tanks, and a cell with dimensions of 32 feet x 12 feet x 21 feet deep containing tanks 3 and 4.

Air is drawn in from the non-radiologically controlled 244-AR ventilation system and passes through a heater, pre-filter, and water scrubber system before entering the 244-AR canyon. The air then passes through the three containment cells and then through two HEPA filter banks before being exhausted at the 296-A-13 stack.

6.2 CALCULATION OF SOURCE TERM

Radionuclide inventory is based on beta/gamma levels found in survey data taken on 5/15/87 and reported on 11/01/94 in Internal Memo 33680-95-047 from Radiological Engineering and ALARA, subject "CCIP Database Update for Second Quarter 1995", dated June 5, 1995. This data shows loose surface beta/gamma contamination at 1 million disintegrations per minute per 100 square centimeters. Assuming worse case scenario, beta (Sr-90/Y-90) as the representative nuclides together with the contamination assumed to be uniformly distributed over all ventilated surface areas, the total curie content available for release from this stacks is shown in the following table.

NUCLIDE	TOTAL AREA (cm^2)	ACTIVITY (dpm /100 cm^2)	TOTAL ACTIVITY (Ci)
Sr-90	2.3×10^7	1,000,000	0.104
Y-90	2.3×10^7	1,000,000	0.104

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APPENDIX B
ADDENDUM

The 6,813 liters (1,800 gallons) estimated to be in the Cell 3 sump is the accumulation of rain water, snow melt, and raw water drainage. The source term contained within the liquid is estimated to be 0.1 curies of strontium-90, as shown in the Tank Farm Stack NESHAP Designation Determination for stack #296-A-13 (WHC 1996b) (Appendix B). The determination was derived using the methodology shown below.

Contained spaces that were ventilated by the 296-A-13 stack consist of the 244-AR Vault canyon and the three cells containing the four tanks. The dimensions and total area are shown below.

Ventilated Surface Areas.

Contained spaces	Width (cm)	Height (cm)	Depth (cm)	Total surface area (cm^2)
Canyon	2,865	1,097	549	1.1 E+07
Cell 1	640	998	640	3.4 E+06
Cell 2	640	998	640	3.4 E+06
Cell 3	975	640	366	2.4 E+06
Tank dimensions	Radius	Height	Bottom area	
Tank 1	305	602	2.9 E+05	1.4 E+06
Tank 2	305	602	2.9 E+05	1.4 E+06
Tank 3	145	305	6.6 E+04	3.4 E+05
Tank 4	145	305	6.6 E+04	3.4 E+05
Total bottom areas			7.1 E+05	-7.1 E+05*
Total combined area				2.3 E+07

* Adjustment to account for tank bottom surface not exposed.

Radionuclide inventory is based on beta/gamma levels found in survey data in Internal Memo 33680-95-047 from Radiological Engineering and ALARA, subject "CCIP Database Update for Second Quarter 1995", dated June 5, 1995 (Appendix C). These data showed loose surface beta/gamma contamination at 1 million disintegrations per minute (dpm) per 100 square centimeters. Very conservatively, beta (Sr-90) is assumed to represent the radionuclide contamination uniformly distributed over all ventilated surface areas. Any concern regarding the depth of contamination is covered using this approach. The total curie (Ci) content available for release is as follows:

Total Vault Area * Contamination Level * Ci Disintegration Conversion Factor = Total Ci

2.3 E+07 cm^2 * 1.0 E+06 dpm/(100 cm^2) * 1 Ci/2.22E+12 dpm
= 0.10 Ci.

The canyon sump has been pumped several times over the last 15 years. The last time the subject sump was pumped was in 1993. A conservative estimate is to assume that the entire 0.10 curie contained within the canyon area is now in the sump.

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APPENDIX C

CCIP DATABASE UPDATE FOR SECOND QUARTER 1995

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Westinghouse Hanford Company | **Internal Memo**

From: Radiological Engineering and ALARA — 33680-95-047
Phone: 376-4187 T7-37
Date: June 5, 1995
Subject: CCIP DATABASE UPDATE FOR SECOND QUARTER 1995

To:

J. D. Butler	T4-03	B. D. Kostoff	S5-60
D. A. De Lucchi	R1-51	J. L. Miller	T6-28
D. R. Ekstrom	L6-52	L. A. Nelsen	N2-50
M. F. Hackworth	T3-20	R. A. Schieffer	T1-27
S. L. Hathaway	S6-62	S. C. Snyder	T5-03
T. E. Hopkins	X3-65		

cc:

E. J. Adams	T4-03*	D. J. Newland	T7-37*
O. D. Berglund	T7-37*	J. L. Shelor	R2-36*
K. W. Gray	T5-57*	R. N. Smith	S6-65*
M. Kaviani	X3-60*	R. L. Watts	L6-52*
R. R. Loeffler	S5-66*	REE File:LB*	
B. H. Lueck, Jr.	S7-81*	*w/o enclosure	
T. D. Merkling	T7-37*		

Enclosed is the current CCIP quarterly update for your facility for the second quarter (April - June 1995). Any changes that you sent as a result of the informal cc:Mail request for April and May should already be incorporated. Please remember that both the "CCIP Data Gathering" and "CCIP Data Change" forms are available as Site Forms. Please be sure to use these Site Forms for any new sites, as well as any changes and/or updates to your data.

Please review the enclosed update sheets for accuracy and completeness, then sign and return them (even if no changes are made) along with any changes to me by **June 23, 1995** at Mail Stop T7-37. All posted Radiological Areas should be included in the listing. The CCIP database has been modified to match the posting definitions found in the DOE Radiological Control Manual. We also encourage you to send CCIP data changes in as reduction activities take place. This will allow for an accurate indicator to the Company Performance Based Incentive associated to contaminated area reduction.

Robert E Elder

R. E. Elder, Senior Health Physicist
ALARA/CCIP Program Office

Enclosure

Quarterly CCIP Update

Thu, Jun 1, 1995   1:23 PM

CCIP ID	Location & Designation	CCIP Sizes				No Changes*
ETHP-035 ETHP	East Tank Farm (Indoor) 244-AR Canyon	ARA Size:	2,288 sq. ft.	RA Size:	2,288 sq. ft.	
		HCA Size:	0 sq. ft.	RCA Size:	0 sq. ft.	
Survey Date: 5/15/87		CA Size:	2,288 sq. ft.	URM Size:	0 sq. ft.	
Report Date: 11/1/94		Soil CA	0 sq. ft.	RBA Size:	0 sq. ft.	
		VHRA Size:	0 sq. ft.	FCA Size:	0 sq. ft.	
		HRA Size:	0 sq. ft.	RMA Size:	0 sq. ft.	

Area: 200 E — Max dpm, βγ 1,000,000 — On Mask? Yes
Loose Surface Contamination? Yes — Max dpm, α 0 — Source Term? No
☒ Active — Occupancy: NEVER — Task Description: — Survey Card/Report #:

CCIP ID	Location & Designation	CCIP Sizes				No Changes*
ETHP-036 ETHP	242-A Evap (Indoor) 242-A Evap.Room	ARA Size:	450 sq. ft.	RA Size:	0 sq. ft.	
		HCA Size:	450 sq. ft.	RCA Size:	0 sq. ft.	
Survey Date: 9/25/89		CA Size:	0 sq. ft.	URM Size:	0 sq. ft.	
Report Date: 11/1/94		Soil CA	0 sq. ft.	RBA Size:	0 sq. ft.	
		VHRA Size:	0 sq. ft.	FCA Size:	0 sq. ft.	
		HRA Size:	450 sq. ft.	RMA Size:	0 sq. ft.	

Area: 200 E — Max dpm, βγ 1,000,000 — On Mask? Yes
Loose Surface Contamination? Yes — Max dpm, α 0 — Source Term? No
☒ Active — Occupancy: QUARTER — Task Description: — Survey Card/Report #:

CCIP ID	Location & Designation	CCIP Sizes				No Changes*
ETHP-037 ETHP	242-A Evap (Indoor) 242-A Evap. Cond. Room	ARA Size:	0 sq. ft.	RA Size:	648 sq. ft.	
		HCA Size:	0 sq. ft.	RCA Size:	0 sq. ft.	
Survey Date: 11/29/89		CA Size:	648 sq. ft.	URM Size:	0 sq. ft.	
Report Date: 11/1/94		Soil CA	0 sq. ft.	RBA Size:	0 sq. ft.	
		VHRA Size:	0 sq. ft.	FCA Size:	0 sq. ft.	
		HRA Size:	0 sq. ft.	RMA Size:	0 sq. ft.	

Area: 200 E — Max dpm, βγ 50,000 — On Mask? No
Loose Surface Contamination? Yes — Max dpm, α 0 — Source Term? No
☒ Active — Occupancy: DAY — Task Description: — Survey Card/Report #:

CCIP ID	Location & Designation	CCIP Sizes				No Changes*
ETHP-038 ETHP	242-A Evap (Indoor) 242-A Evap. Load Out Room	ARA Size:	216 sq. ft.	RA Size:	216 sq. ft.	
		HCA Size:	0 sq. ft.	RCA Size:	0 sq. ft.	
Survey Date: 11/13/89		CA Size:	216 sq. ft.	URM Size:	0 sq. ft.	
Report Date: 11/1/94		Soil CA	0 sq. ft.	RBA Size:	0 sq. ft.	
		VHRA Size:	0 sq. ft.	FCA Size:	0 sq. ft.	
		HRA Size:	0 sq. ft.	RMA Size:	0 sq. ft.	

Area: 200 E — Max dpm, βγ 50,000 — On Mask? Yes
Loose Surface Contamination? Yes — Max dpm, α 0 — Source Term? No
☒ Active — Occupancy: MONTH — Task Description: — Survey Card/Report #:

** √ for no changes; complete a CCIP Data Change Sheet for those locations that have changed.*

APPENDIX D

TLM SOLIDS COMPOSITE INVENTORY ESTIMATES

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Single-Shell Tank 241-AX-104 [1,2]							
TLM Solids Composite Inventory Estimate*							
Physical Properties							
Total TLM Waste	3.56E+04 kg			(7.00 kgal)			
Heat Load	3.03 kW			(1.04E+04 BTU/hr)			
Bulk Density	(1.34 g/cc)						
Void Fraction	0.807						
Water wt%	61.5						
TOC wt% C (wet)	0						
Radiological Constituents	**Ci/L**	**µCi/g**	**Ci**	**-95 CI (Ci/L)**	**-67 CI (Ci/L)**	**+67 CI (Ci/L)**	**+95 CI (Ci/L)**
Sr-90	16.6	1.23E+04	4.39E+05	14.9	16.1	16.8	16.9
Tc-99	1.69E-04	0.126	4.47	6.38E-05	1.16E-04	2.22E-04	2.73E-04
I-129	3.21E-07	2.39E-04	8.50E-03	1.21E-07	2.21E-07	4.21E-07	5.18E-07
Cs-137	0.629	468	1.67E+04	0.238	0.434	0.827	1.02
U-232	6.04E-12	4.49E-09	1.60E-07	2.28E-12	4.17E-12	7.93E-12	9.76E-12
U-233	1.62E-13	1.21E-10	4.30E-09	6.15E-14	1.12E-13	2.13E-13	2.62E-13
U-234	1.00E-07	7.48E-05	2.66E-03	3.80E-08	6.93E-08	1.32E-07	1.62E-07
U-235	4.19E-09	3.12E-06	1.11E-04	1.59E-09	2.90E-09	5.51E-09	6.78E-09
U-236	2.35E-09	1.75E-06	6.23E-05	8.91E-10	1.62E-09	3.09E-09	3.80E-09
U-238	9.84E-08	7.33E-05	2.61E-03	3.73E-08	6.80E-08	1.29E-07	1.59E-07
Np-237	5.48E-07	4.08E-04	1.45E-02	2.07E-07	3.78E-07	7.19E-07	8.85E-07
Pu-238	4.38E-05	3.26E-02	1.16	3.43E-05	4.14E-05	4.55E-05	4.71E-05
Pu-239	2.05E-03	1.53	54.4	1.61E-03	1.94E-03	2.13E-03	2.21E-03
Pu-240	3.20E-04	0.238	8.48	2.51E-04	3.02E-04	3.33E-04	3.44E-04
Pu-241	3.34E-03	2.49	88.6	2.62E-03	3.16E-03	3.47E-03	3.60E-03
Pu-242	1.10E-08	8.22E-06	2.92E-04	8.64E-09	1.04E-08	1.15E-08	1.19E-08
Am-241	7.15E-05	5.33E-02	1.90	2.71E-05	4.94E-05	9.40E-05	1.16E-04
Am-243	1.80E-09	1.34E-06	4.77E-05	6.81E-10	1.24E-09	2.37E-09	2.91E-09
Totals	**M**	**µg/g**	**kg**	**-95 CI (M or g/L)**	**-67 CI (M or g/L)**	**+67 CI (M or g/L)**	**+95 CI (M or g/L)**
Pu	3.44E-02 (g/L)	---	0.913	2.70E-02	3.25E-02	3.58E-02	3.71E-02
U	1.24E-03	220	7.81	4.69E-04	8.55E-04	1.63E-03	2.00E-03

*Unknowns in tank solids inventory are assigned by Tank Layering Model (TLM).

1. Letter Report, T. Duran, Los Alamos National Laboratory, Los Alamos, New Mexico, to J. Cammann, WHC, Richland, WA, HDW Model Rev. 4 Preliminary Inventory Estimate Tables for the Radionuclides, dated August 16, 1996.

2. Discrepancies that exist between the physical properties on the inventory estimates will be adressed in the HDW Model Rev 4.

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APPENDIX E

HEAT GENERATION OF RESIDUAL SLUDGE IN TANK 241-AX-104

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ate: . June 15, 1978 No: . 60120-78-040 J

O: (Name, Organization, Internal Address)
. G. D. Campbell
. Waste Process Engineering
. 2704-E Bldg., 200 East Area

FROM: (Name, Organization, Internal Address, Phone)
. J. S. Buckingham
. . Chemical Sciences Group
. 222-S Bldg., 200 West Area
. 2-2487

ject: . Heat Generation of Residual Sludge in Tank 104 AX

A sample of the residual sludge remaining in Tank 104 AX was analyzed. The sample contained 32.9 Ci/ℓ $^{89+90}Sr$, 1.7 Ci/ℓ ^{137}Cs, and 0.83 Ci/ℓ ^{155}Eu. The calculated heat generation was 0.2316 watts/ℓ. Unfortunately the amount of sample received for analyses was very small and there was a question as to how representative it was. To confirm the analyses a sample of 104 AX sludge which was sluiced to 004 AR was analyzed. The 004 AR material showed 77.9 Ci/ℓ $^{89+90}Sr$ and 1.26 Ci/ℓ ^{137}Cs. The difference between the two analyses is indeed enough to cast doubt on 104 AX sample. I suggest you use both analyses to calculate the heat impact on the tank and if the difference is significant try to get a more representative sample of the residual sludge. Analyses of the sludges are shown below:

Analysis of Residual 104 AX Sludge

$^{89+90}Sr$	32.9 Ci/ℓ	0.223 watts/ℓ
^{137}Cs	1.7 Ci/ℓ	0.008 watts/ℓ
^{155}Eu	0.83 Ci/ℓ	0.0006 watts/ℓ

Analysis of 004 AR Sludge

$^{89+90}Sr$	77.9 Ci/ℓ	0.530 watts/ℓ
^{137}Cs	1.26 Ci/ℓ	0.006 watts/ ℓ

Please let me know your decision on taking another residual sludge sample.

JS Buckingham

J. S. Buckingham
Staff Chemist
Waste Chemistry Unit

JSB:rm

Information:
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F. M. Jungfleisch FMJ
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Process Aids (7)

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